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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/592,950	06/13/2000	Xuesong Chen	9351-20/HSF	7043

1059 7590 07/31/2002

BERESKIN AND PARR
SCOTIA PLAZA
40 KING STREET WEST-SUITE 4000 BOX 401
TORONTO, ON M5H 3Y2
CANADA

EXAMINER

ALEJANDRO, RAYMOND

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 07/31/2002

5

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/592,950

Applicant(s)

CHEN ET AL.

Examiner

Raymond Alejandro

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 1-3 and 13-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06/13/00 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group II in Paper No. 4 is acknowledged. The traversal is on the ground(s) that "the claims do indeed all relate to one invention, and can properly be examined in one application". This is not found persuasive because the search required for the elected claims is not required for non-elected claims; and thus, the search required for the claims 4-12 (fuel cell system) is not required for claims 1-3 (the tubular reactor) and claims 13-16 (the method of operating).

The requirement is still deemed proper and is therefore made FINAL.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 18, 27, . A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities: in the Brief Description of the Drawings, the specification does not include a description for figure 3C. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 4-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 4 recites the limitation "a catalyst" in lines 27 (page 13) and line 1 (page 14). There is insufficient antecedent basis for this limitation in the claim. The claim recite the same limitation twice, thus, it is uncertain as to what particular catalyst material, if different, the claims might make further reference to.

7. Claim 4 recites the limitation "the fuel" in 28. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 4-7 and 912 are rejected under 35 U.S.C. 103(a) as being unpatentable over Micheli et al 5541014.

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The instant application is directed to a fuel cell system wherein the claimed inventive concept comprises the specific catalytic reactor arrangement. Other limitations include the fuel cell stack, the particular reactor configuration and connections.

With respect to claim 4, 8-10:

Micheli et al disclose a fuel cell including a high pressure combustor used to combust the excess fuel from the topping fuel cell cycle to further heat the pressurized gas driving turbine (abstract). A low pressure combustor is used to combust the excess fuel from a fuel cell to reheat the gas stream passing out of the turbine which is used to preheat the pressurized air stream entering another fuel cell before passing into the bottoming fuel cell cathode (abstract). It is disclosed that fuel cell includes two porous electrodes bonded to a solid oxide ceramic membrane disposed between them. The fuel is supplied to the anode electrode through an anode gas flow channel while oxidant is supplied to the cathode electrode through a cathode gas flow channel (col 4, lines 38-45); oxygen ions can flow through the solid oxide lattice (col 4, lines 45-47). It is disclosed that electrode materials act also as catalyst (col 4, lines 62-66). Figure 1 shows the fuel inlet and air inlet, and reactant flow distribution system (manifold). The figure also illustrates that the combustor 47 has cathode exhaust (oxidant) and anode exhaust inlets (fuel); and a conduit 73 which provides a heated and humidified fuel back to the fuel cell. It is disclosed that it may be required to add excess fuel, thus providing excess fuel to the high pressure combustor and raise the temperature of the gases from the combustor (col 6, lines 26-33). The air distribution system and the fuel recirculating mean is also illustrated in Figure 1.

As for claim 5:

The cells are connected in series to form a stack (col 4, lines 54-57).

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As to claim 7:

Figure 1 shows that the outlet of the high pressure combustor is connected to the main fuel inlet through conduit 73; and to the gas channel of a second fuel cell through conduit 59. It is disclosed that it may be required to add excess fuel, thus providing excess fuel to the high pressure combustor and raise the temperature of the gases from the combustor (col 6, lines 26-33).

Regarding claims 11:

Figure 1 depicts that the high pressure combustor is provided in the main air supply line of the second fuel cell stack; the low pressure combustor is connected to the anode gas channel of the first fuel cell; the low pressure combustor receiving air through secondary conduits. It is further disclosed that it may be required to add excess fuel, thus providing excess fuel to the high pressure combustor and raise the temperature of the gases from the combustor (col 6, lines 26-33). Accordingly, air is then supplied in a lesser amount.

With respect to claims 6 and 12:

It is disclosed that both the high and low pressure combustor receive the particular reactant streams through conduits (col 5, lines 35-40 and col 6, lines 9-12).

Micheli et al disclose a fuel cell system according to the foregoing. However, Micheli et al does not expressly disclose the particular catalytic reactor directly connected to the specific stream distribution arrangement of the fuel cell itself and its tubular shape.

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make the fuel cell system of Micheli et al having the specific catalytic reactor stream connection as Micheli et al disclose that the effluents to/from the fuel cell cycles

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can be fed to combustors in which the excess fuel is burned to raised the gas stream to a desired temperature. Accordingly, this fuel cell system may provide a thermodynamically optimized system for electrical power production due to the power generating subsystems being operated. Further, the cycle efficiency can be enhanced by adding all of the heat energy obtained from unreacted and reacted stream effluents to/from the fuel cell anode and cathode and/or supply source. Moreover, this arrangement thus provide the heat and humidity required for proper operation of the fuel cell system.

As to the specific reactor shape, it would have been obvious to one skilled in the art at the time the invention was made to recognize that Micheli et al inherently disclose tubular combustors, as Micheli et al's combustors are in fluid communication with conduits for receiving and exhausting streams, and hence, since those conduits are either pipes or tube through which the fluid is conveyed, it would be obvious to make the combustor having a similar configuration so as to enhance fluid transmission or distribution throughout the entire fuel cell system.

10. Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Micheli et al 5541014 as applied to claim 7 above, and further in view of Edlund 6376113.

Micheli et al is applied and incorporated herein for the reasons above. Additionally, Micheli et al does not disclose either a pressure gauge, flow meter or valve.

Edlund et al teach pressure regulators (col 3, lines 39-40); purge valve (col 3, lines 55-56); throttle valve (col 4, lines 38-40).

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to use this flow associated devices in the fuel cell system of Micheli et al as Edlund et al teach that these devices either ensure the pressure of the reactant supplied

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remains at an acceptable value, regulate the stream flow through and/or assist to control periodic feeding of reactant stream in the fuel cell system. It is also noted that this flow associated devices can be employed in any fluid distribution system regardless of its chemistry and/or chemical environment.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (703) 306-3326. The examiner can normally be reached on Monday-Thursday (8:30 am - 7:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro
Examiner
Art Unit 1745


Patrick Ryan
Supervisor/Examiner
Tech. Center 1700